

**COMP2211**

**University of Southampton**

**Software Engineering Group Project**

**Deliverable 1**

**Project Envisioning**

**Version History**

| <b>No.</b> | <b>Date</b>                | <b>Comments</b>  |
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| 1          | 3 <sup>rd</sup> March 2023 | First Submission |

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# User Understanding

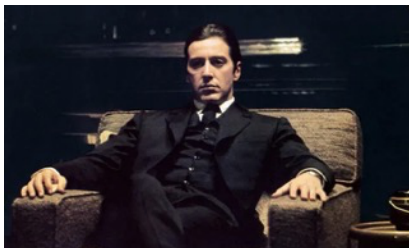
**Table 1.1 Stakeholder Analysis:** Analysis of stakeholders and their respective roles

| Stakeholder                             | Type         | Role/Description   |
|---|--------------|--|
| Business owners                         | Tertiary     | System affects business efficiency/performance thus affecting profits  |
| Passengers/Customers                    | Tertiary     | Source of income to the business   |
| Software developers                     | Facilitating | Provides and maintains the software to operate daily activities  |
| Investors                               | Tertiary     | Provided funds to invest in the business   |
| Pilots                                  | Secondary    | Receive runway calculation from operator   |
| Airport operators<br>(Airport managers) | Secondary    | Work on the ground and are responsible for managing all aspects of airport operations  |
| Aviation regulators<br>(CAA)            | Secondary    | Aviation regulators have a regulatory interest in the use of the landing distance calculator to ensure the safety of aircraft and passengers.<br>(Make sure airports follow the law) |
| Air traffic controllers                 | Primary      | Rely on the system to provide accurate information about an aircraft's landing performance. (Provide guidance and safety for pilots)   |
| Ground crew                             | Secondary    | Work closely with pilots, air traffic controllers, and other airport personnel to facilitate the smooth flow of air traffic.   |

## Personas

List of personas representing main stakeholders, including details such as their demographic information, objectives, and beliefs to produce software that matches the requirements and expectations.

### Business owner/ customer persona: Tony (Owner)



Tony is a 50-year- old CEO of an airline company. Tony started his career as a baggage handler and worked his way up to his current position. He has in-depth knowledge of how the entire company operates and is responsible for the overall management of the organization. Tony's main objective is to ensure that the company is profitable and that its operations are efficient, safe,

and reliable. He is pragmatic and focused on streamlining processes in the company and removing outdated or useless systems and features. Tony values transparency, accountability, and collaboration and is committed to leading the company with integrity and excellence. He is also interested in leveraging technology and innovation to enhance the customer experience and improve the efficiency of the company's operations.

### **Employee persona: John (Pilot)**



John is a commercial airline pilot with over 10 years of experience, and his main responsibility is to ensure the safety of his passengers during flights. His job heavily relies on the landing distance calculator to determine the minimum runway length required for safe landings. Accuracy and reliability in the landing distance calculator is important for John, and he prefers tools that are easy to use and provide clear information about the aircraft's landing performance.

### **Employee persona: Amy (Aviation Regulators)**



Amy is a 30-year-old aviation regulator with 15 years of experience. She has a degree in aeronautical engineering and is responsible for ensuring airlines and airports comply with safety regulations. Amy works with a team to conduct inspections, investigations, and audits, as well as develop and enforce safety regulations. She reports directly to the director general and values transparency and clear communication with aviation stakeholders.

Amy's primary objective is to ensure the safety and regulation of all aviation activities within her jurisdiction.

### **Employee persona: David (Airport Operator)**



David's role is to oversee the daily operations of the airport and ensure the safety and efficiency of all aircraft movements. He relies on the landing distance calculator to determine the appropriate runway length required to accommodate various types of aircraft. David places a high value on tools that provide accurate and reliable information, while also being flexible

enough to accommodate a diverse range of aircraft and their performance characteristics. He believes that having access to the right tools and technology is essential to ensuring the airport's success and meeting the needs of airlines and passengers.

### **Employee persona: Alex (Ground Crew)**



Alex is a 27-year-old ground crew member who has been working at a busy international airport for the past three years. He is proficient in using various equipment, including the landing distance calculator, to ensure the safety and efficiency of aircraft operations on the ground. Alex's primary objective is to ensure safe and efficient aircraft movements and he believes his work is

critical to the safety and well-being of passengers and crew. He values teamwork and clear communication with his colleagues to ensure smooth operations.

#### Employee persona: Sarah (Air Traffic Controller)



Sarah is an air traffic controller at a busy international airport. She has a background in aviation and her job function is to ensure the safe and efficient flow of aircraft in and out of the airport. She uses the landing distance calculator to make decisions about runway usage and sequencing. Sarah prioritizes tools that offer a user-friendly interface and deliver precise and clear information. Her objective is to monitor the movement of all aircraft. She has a strong belief in the importance of following procedures and protocols to maintain safety. Sarah can feel anxious about the potential for human error or technical malfunctions in the aircraft or airport systems.

#### Employee persona: Kenny (Software Developer)



Kenny is a software developer with a background in computer science and specialization in aviation software. He is part of the development team responsible for the landing distance calculator tool used in the aviation industry. Kenny's job function involves designing and implementing software solutions to enhance the accuracy and reliability of the tool. He is particularly focused on improving the user experience by ensuring a user-friendly interface and intuitive design. Kenny works in an organization that values innovation, and he is constantly seeking new ways to improve the tool. He believes that the landing distance calculator is a critical tool for ensuring aviation safety and efficiency. Kenny is also mindful of the importance of data security and ensures that the tool complies with all industry regulations and standards. He is anxious about potential software bugs or errors that could impact the tool's performance and works tirelessly to ensure its reliability.

## Requirements Planning

**Table 1.2 User Stories:** Table showing user stories derived from project requirements

| As a                   | I want to   | So that  |
|------------------------|---|--|
| Air traffic controller | Use the application at any UK commercial airport                | I can access it at the control tower                     |
|                        | Calculate the new runway distances when an obstacle is present. | I can decide whether the official process is worthwhile. |

| As a                   | I want to  | So that   |
|------------------------|--|---|
| Air traffic controller | View the breakdown of the calculations   | They can be compared with the paper results.  |
|                        | View the recalculated runway distances and the originals                                     | Difference between them can be compared easily.   |
|                        | View the airport from top-down and side-on views simultaneously or individually in 2D.       | I can better visualize the runway.  |
|                        | Have a list of predefined obstacles  | I can test out the program without creating a new obstacle.                             |
|                        | Import and export details of obstacles, airports, and other data using appropriate XML files | They can be stored/transferred to others  |
|                        | View the details of the runway and the distances used for runway declaration from both views | I can have a better understanding of how the runway declaration was done in the system. |
|                        | Make sure that the threshold that has the lowest value to always on the left                 | It follows the formalized format.   |
|                        | Automatically rotate the runway strip to match its compass heading                           | The direction of the runway is clear and easily identifiable.                           |
|                        | View the cleared and graded areas in a top-down view   | I can manage the area more effectively.   |
|                        | View the TOCS and ALS slope caused by the obstacles in side-on view                          | I can make a better-informed decision based on the visual.                              |
|                        | Select different runways and thresholds, with views changing accordingly                     | Application is compatible with different runways in a different airport                 |
|                        | Have notifications displayed for any actions that occur                                      | I am fully aware of what has taken place  |

**Table 1.3 Product Backlog:** List of requirements sorted using MoSCoW prioritisation

| ID | User Story (Functional Requirements)  | Priority |
|----|---|----------|
| 1  | As an air traffic controller. I want to calculate the new runway distances when an obstacle is present. So that I can decide whether the official process is worthwhile   | Must     |
| 2  | As an air traffic controller. I want to be able to view the recalculated runway distances and the originals. So that the difference between them can be compared easily.  | Must     |
| 3  | As an air traffic controller. I want to view the airport from top-down and side-on views simultaneously or individually in 2D. So that I can better visualize the runway. | Must     |
| 4  | As an air traffic controller. I want to view the cleared and graded areas in top-down view. So that I can manage the area more effectively.                               | Must     |

| ID | User Story (Functional Requirements)  | Priority |
|----|---|----------|
| 5  | As an air traffic controller. I want to view the details of the runway and the distances used for runway declaration from both views. So that I can have a better understanding of how the runway declaration was done in the system. | Must     |
| 6  | As an air traffic controller. I want to be able to view the breakdown of the calculations. So that they can be compared with the paper results.   | Should   |
| 7  | As an air traffic controller. I want to import and export details of obstacles, airports, and other data using appropriate XML files So that they can be stored/transferred to others.  | Should   |
| 8  | As an air traffic controller. I want to be able to use it at any UK commercial airport. So that I can access it at the control tower.   | Should   |
| 9  | As an air traffic controller. I want to select different runways and thresholds, with views changing accordingly. So that the application is compatible with different runways.   | Should   |
| 10 | As an air traffic controller. I want to view the TOCS, and ALS slope caused by the obstacles in side-on view. So that I can make a better-informed decision.  | Should   |
| 11 | As an air traffic controller. I want to have a list of predefined obstacles. So that I can test out the program without creating a new obstacle.  | Could    |
| 12 | As an air traffic controller. I want the threshold that has the lowest value to always be on the left. So that it follows the formalized format.  | Could    |
| 13 | As an air traffic controller. I want to automatically rotate the runway strip to match its compass heading. So that the direction of the runway is clear and easily identifiable.   | Could    |
| 14 | As an air traffic controller. I want to have notifications displayed for any actions that occur. So that I am fully aware of what has taken place.  | Could    |
| 15 | As an air traffic controller. I want to zoom and pan the views. So that I can focus on the part of the runway that I am working with.   | Won't    |
| 16 | As an air traffic controller. I want to print out the situation of the runway in textual format. So that it could be revise with ease.  | Won't    |

| ID | Technical requirement (Non-functional requirement) |   |
|----|--|---|
| 1  | Availability                                       | The application should be available anytime anywhere.             |
| 2  | Performance  | The result of the calculation should load in less than 5 seconds. |
| 3  | Error handling                                     | Error must be handled with appropriate error message.             |
| 4  | Reliability  | Must perform without failure more than 95% of the time.           |

# Project Planning

**Table 1.4 Increment Plan:** Outline for the three increments

| First Increment  |
|--|
| <p><b>The first code increment will focus on runway recalculation.</b></p> <p>We plan to have a working prototype that</p> <ul style="list-style-type: none"> <li>• Has an interface where recalculation will be done when user input obstacle details</li> <li>• Shows detail of recalculation in a textual form</li> <li>• Depending on progress, the runway details will either be pre-defined or available to be edited if our progress is good</li> </ul> |
| Second Increment   |
| <p><b>The second code increment will focus on the visualization of runway based on recalculated value</b></p> <p>We plan to have a working prototype that</p> <ul style="list-style-type: none"> <li>• Has the main visualization required: top-down, side-view and simultaneous view</li> <li>• Implements the notification feature in which users will be able to keep track of changes in system such as successful update of values, etc.</li> </ul>       |
| Third Increment  |
| <p><b>The third code increment will focus on importing and exporting of data including, airports, obstacles, and runway details</b></p> <p>We plan to have a working prototype that</p> <ul style="list-style-type: none"> <li>• Allows users to import XML files containing airport or runway information for calculation</li> <li>• Allows users to export result in corresponding file formats</li> </ul>   |

**Table 1.5 Sprint Plan:** User stories extracted from backlog for next sprint

| User Stories for First Sprint   |
|---|
| <p>As an air traffic controller, I want to calculate the new runway distances when an obstacle is present.<br/>So that I can decide whether the official process is worthwhile.</p> |



| User Stories for First Sprint (cont.)  |
|--|
| <p>As an air traffic controller, I want to be able to view the recalculated runway distances and the originals<br/>So that the difference between them can be compared easily.</p> |
| <p>As an air traffic controller, I want to be able to view the breakdown of the calculations<br/>So that they can be compared with the paper results.</p>                          |
| <p>As an air traffic controller, I want the threshold that has the lowest value to always be on the left.<br/>So that it follows the formalized format.</p>                        |
| <p>As an air traffic controller, I want to have a list of predefined obstacles<br/>So that I can test out the program without creating a new obstacle.</p>                         |

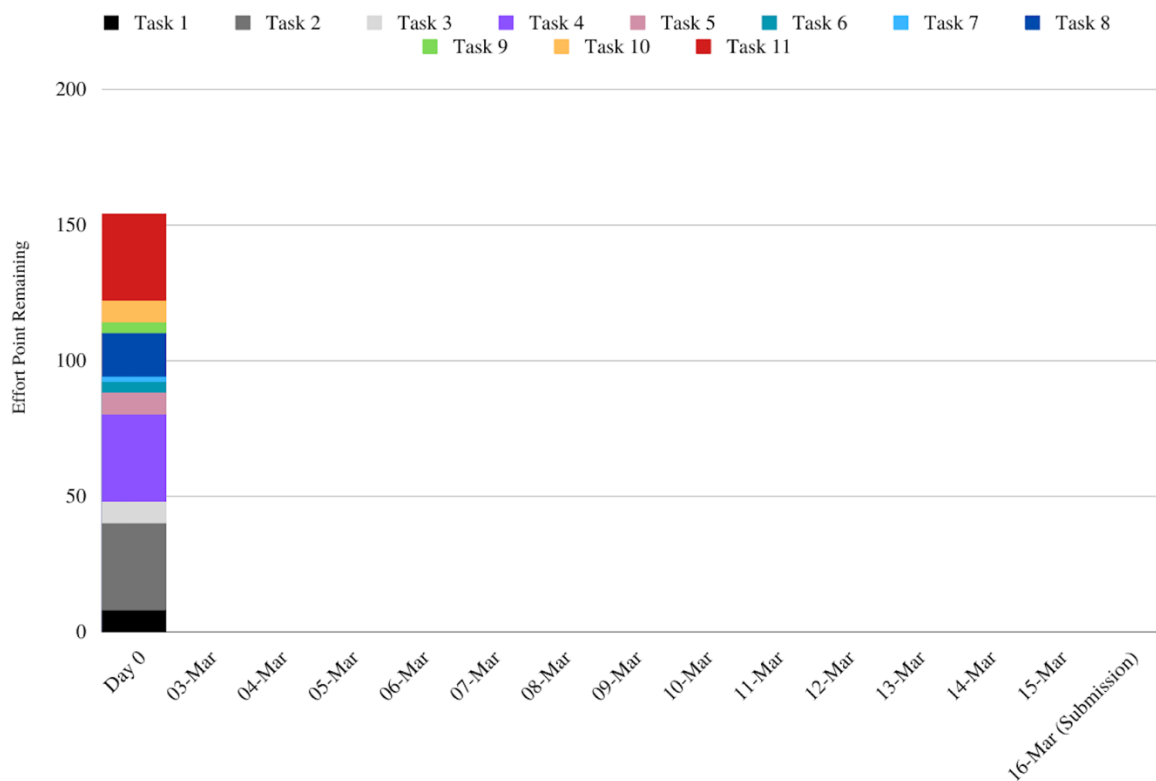
**Table 1.6 Tasks for First Sprint:** List of tasks based on sprint plan and their corresponding effort points determined using planning poker

| No. | Tasks   | Effort (pts) |
|-----|---|--------------|
|     | <b>Application - Functionalities</b>                        |              |
| 1.  | Research and setting up GitHub for project                  | 8            |
| 2.  | Code for calculation of new runway distances                | 32           |
| 3.  | Have a list of obstacles to be used for testing             | 8            |
| 4.  | A basic interface design and layout using Scene Builder     | 32           |
| 5.  | Show originals and calculated values                        | 8            |
| 6.  | Show calculation breakdown                                  | 4            |
| 7.  | Threshold displayed based on format, with lower on the left | 2            |



| No.             | Tasks   | Effort (pts) |
|-----------------|---|--------------|
| 8.<br>9.<br>10. | <b>Design and Planning</b>  |              |
|                 | Using UML diagrams, storyboards and scenarios to support design decisions | 16           |
|                 | Construction of burndown chart for increment 1 based on actual progress   | 4            |
| 10.             | Introduction of sprint plan for increment 2                               | 8            |
| 11.             | <b>Testing</b>  |              |
|                 | Test and verifying the correctness of application                         | 32           |

## Day Zero Burndown Chart for First Increment



## Project Set-Up

### Summary of Project Infrastructure

- Project Management:** Defining and executing project plans and schedules, which includes a project manager who oversees the daily operations, manages project risks and issues, and ensures project milestones are completed.
- Calculations:** Performing calculations by developing a tool that can provide the revised runway parameters, a visualization of the obstacle, and a summary of the calculations.

3. **Data Management:** Manages the data for the application, including a data team responsible for gathering, storing, and maintaining information, a data warehouse, and a collection of data management tools.
4. **User Interface Design:** Designing of an intuitive and easy-to-use interface, design tools, and usability testing to ensure the interface is user-friendly.
5. **Development and Testing:** Developing and testing the application, enabling users to input standard runway information and obstacle data to obtain revised runway parameters, obstacle visualization, and calculation summary.
6. **Revisiting Product:** After delivering the product to supervisor and user, any changes or addition required can be done and the system can be updated.

**Table 1.7 Risk Analysis:** Table showing risks and mitigation strategy

| <b>Risk</b>  | <b>Probability<br/>P (1, low – 5, high)</b> | <b>Severity<br/>S (1, low – 5, high)</b> | <b>Risk<br/>Exposure, E<br/>(E = P x S)</b> | <b>Mitigation<br/>(Minimizing the likelihood of the risk being realized)</b>                  |
|--|---|--|---|---|
| Delay in getting individual tasks done                       | 4   | 4  | 16*   | Making sure tasks are simple, short and doable in a certain timeframe.                        |
| Lack of online sources/materials                             | 3   | 3  | 9   | Finding offline sources like books.   |
| Lack of expertise/knowledge in certain areas                 | 4   | 3  | 12  | The team will take effort to learn the and acquire the skills needed to complete the project. |
| Risk of unfortunate events (a member not being able to work) | 3   | 3  | 9   | Even in case of such events, rest of the team will be still able to complete the project.     |

### Summary of Agile Methodologies

Agile methodologies are adopted to provide a more efficient and smooth development process so that we can deliver the project on time. By prioritizing flexibility, collaboration, and continuous improvement in the process, the cycle will involve establishing goals, working in short iterative cycles, gathering feedback from supervisor and users, emphasizing communication within team and prioritizing delivering a working software over extensive documentation or planning.

**Table 1.8 Summaries of Software Tools Adopted**

| <b>Name</b>        | <b>Description and usage</b>   | <b>Type of tool</b>   |
|--------------------|--|-----------------------|
| WhatsApp           | Primary means of communication for scheduling meetups, sharing information and general chat.   | Communication         |
| Discord            | Provides multiple servers to share information and collaborate. Allows instant voice/video calls and sharing of files.   | Communication         |
| Microsoft Outlook  | To schedule meetings and clarify questions regarding the project with supervisor and user.   | Communication (Email) |
| Jira/Trello        | Provides a Scrum board to manage tasks, a backlog and sprint planning. Allows for easy collaboration, it is very powerful in implementing the Agile Scrum framework. It can help the team to plan and execute sprints more effectively, track progress in real-time, and identify areas for improvement. | Planning              |
| IntelliJ           | A popular IDE that the team is familiar with for doing projects in Java, it offers debugging, integration with build tools, supports for framework and libraires.  | Coding                |
| GitHub             | GitHub is a code hosting platform for version control and collaboration. It lets the team work together on projects from anywhere.   | Coding                |
| Scene Builder      | Used for designing JavaFX application user interfaces.   | Coding                |
| Visual Studio Code | To edit XML files to be used for the system.   | Coding                |